Fisher T, Wood N & Keyte J (2008). *Hands on - hands off; on hitting your thumb with a virtual hammer*. Proceedings of Design Research Society conference, Sheffield, July 2008. Available from www.nicolawood.net

# Hands on - hands off: on hitting your thumb with a virtual hammer

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## Abstract

In a wired world even the most physically embodied craft skills are affected by computer facilitated communication. To consider how different sorts of space – both real and virtual – influence the learning of craft skills this paper presents three types of space – the 'real' space of a jewellery workshop, an online 'wiki' space for learning how to make a folding knife mediated by face to face interaction and an online discussion group about French Horn making. Some features common to the learning of any craft skill are discussed as well as some current ideas about the influence of networked communication on the way people relate to each other. Conclusions are drawn about the relationships between different types of learner, different types of skill and different types of learning space which demonstrate that while there may be no substitute for face to face contact in learning the most embodied craft skills, even in real-world settings a significant proportion of learning depends on social interaction which may be reproduced online.

### Keywords

Craft learning; Apprenticeship; Communities of Practice; Online Networks

This paper discusses the relationship between the online 'world' and the acquisition of craft skill. It discusses some aspects of the way that people learn to make things by hand in the context of some of the ways that people can interact online. Superficially the two subjects seem unlikely partners. Craft has traditionally been learned through long periods of repetitious training at physical tasks in the presence of a 'master' and in the company of other learners – features of a traditional apprenticeship (Epstein 1998). In the last 150 years this type of learning has been institutionalized and supported by the formal study of technical subjects and complementary skills such as drawing but the emphasis on physical engagement has remained. In contrast, the internet seems characterized by physical disengagement. When it was still to some extent science fiction, William Gibson painted a picture of a networked world that left behind the 'meat' world of everyday physicality, and with it, presumably, the production of artifacts by hand (Gibson 1986).

However, even in settings that are 'traditional' because they involve protracted face-to-face contact between learner and teacher, the learning of craft skill involves important elements that supplement the necessary interaction with material and the requirement to be in the same physical space as the teacher. Jean Lave and Etienne Wenger stressed that learning is a process that is always situated in a social setting in which learners and experts participate (1991). Their concept of 'legitimate peripheral participation' neatly stresses the degree to which teachers and learners are placed in a network of relationships in which all are more or less peripheral to an imagined 'core' of knowledge; in principle this network could be real or virtual, or combine the two. In the context of craft

learning, networks of learning may have an economic impact as the basis for networks of innovation.

The evidence presented below describes three settings for craft learning. The first is a BA course in Metalwork and Jewellery that is traditional in that it involves high levels of face to face contact between learners, their teachers and fellow learners (example 1 below - Author 2). The second is a research project centred on the Sheffield knife-making tradition concerned with understanding how to support craft learning with multimedia and online resources that combines face to face contact with a 'Wiki' space and discussion board (example 2 below – Wood). The third is a group of French Horn makers/ repairers who have formed a closed email group – the 'Geyer Guild' – through which to support each other with information and discussion (example 3 below – Author 1).

These settings are comparable beyond the fact that they all involve individuals learning how to make metal objects by hand as they all involve the networks of relationship that Lave and Wenger identify. More importantly however, they are notable because they describe instances of *craft* learning; this type of learning is in itself distinctive and the contribution of this paper is to consider how its distinctiveness – particularly the highly embodied nature of the learning that it requires - may play out in a virtual network that cannot provide embodied engagement.

An extensive literature describes the potential for digital means to *influence* craft processes (e.g. Lindsey 2001), and for new types of craft to emerge *out of* digital media (e.g. McCullogh 1996). However these are not relevant phenomena here as the craft processes referred to in this paper are more or less traditional in their reliance on hand skill and direct experiment with materials. The very extensive literature on the consequences for our post-industrial epoch of information and communication technologies is more relevant to this paper (Castells 2000). However, while the characteristics of our epoch form the backdrop for this discussion, the scope of this discussion restricts attention to instances where the old and new come together in the 'networked' learning of craft skills.

Discussing what he names 'networks of experience' Castells notes the importance of the internet as an 'instrumental tool' for collective learning (bid: 21). The nature of craft learning, when seen from the perspective of the learner or the craftsperson rather than the social theorist, resonates with Castells' Networked Society but at a different scale. Humans are not the only, or necessarily always the most important 'agents' involved in craft learning. Craft learning involves reflexive and embodied interaction with materials, tools, processes; dialogues between the learner and these elements are as important as dialogues with other humans. Given that aspects of craft learning will always necessitate what Dant has called 'material interaction' (2008), it may be the case that only some of these elements can ever be directly subsumed into a distributed network.

To prepare for the description of the three settings for craft learning that follows, it is appropriate here to briefly sketch in some ways of understanding craft learning and thereby to identify some of the distinctive features it has that derive from a learner's necessary engagement with physical material. Perhaps because it has been common for commentators to be concerned with learning academic or theoretical subjects, formulations of the nature and acquisition of craft skill stand out in discussions by, among others, John Ruskin and William Morris in the nineteenth century and in the twentieth, Christopher Alexander, David Pye and Peter Dormer. Morris called craft skill 'the art of unconscious intelligence' (1877: 241) and Alexander argued that pre-modern material cultures in general could be described as 'unselfconscious' (1964: 33) because the knowledge of how to make their material things is embodied in the objects themselves and the skill of the people who can make them rather than in abstract formulations. Dormer described craft skill as 'personal knowhow'; knowledge which exists only in people and networks of people, and which is learned and absorbed from others and through

practice (1997). The observation that craft skill is to some extent 'unconscious' may be the principle that leads to the assumption that it can only be acquired by a learner in the physical presence of a teacher. However ideas that come from the work of Polanyi and Dewey suggest that it has this in common with other types of knowledge. As Polanyi famously put it 'we know more than we can tell' (1966: 4) and applying this insight to the 'spaces' of craft learning helps to indicate how different spaces may be appropriate for different types of learner.

# Three learning spaces

## *Example 1: learning in a physical space*

This example draws on Julia Author 2's experience of teaching a BA in metalwork and jewellery. It identifies aspects of the social relationships that emerge as a consequence of this type of learning space and that support learning. It notes the importance of co-location for the acquisition of certain types of skill.

The physical envelope for the course is a suite of workshop spaces, shared by 3 year-groups of 25 learners. The course aims to help students to learn a wide range of metalworking skills, and to facilitate some specialisation, for example in silversmithing techniques such raising. The structure for the students learning draws quite heavily on a traditional apprenticeship model, involving a good deal of direct demonstration of techniques, though some of the knowledge that students acquire is codified in formal lectures that follow a set pattern rather than being introduced solely in the context of craft making. So learners are often introduced to the theory of a technique, followed by a demonstration of it to a small group of learners. This is followed by a period in the workshop practicing the technique with support from the expert tutor in a larger group of about 25 learners.

The course belongs to a tradition of training designer-makers in crafts subjects that is well developed in the UK, and most students aspire to practice as individual studio craftspeople. For this reason, they are expected to develop a creative focus, acquire design skills and contextual knowledge as well as developing craft skills. Structured through a sequence of projects and assessments the course starts with students learning a series of basic skills. They are helped to become more independent in their learning as they progress and are encouraged to seek the help that they need, to research skills and practice them with a lower level of direct instruction. This gradual reduction in the level of prescribed support from experts, along with the fact that learners continue to use the shared workshops beyond teaching input to practice and develop their learning means that students work alongside each other for long periods throughout the course.

The workshop space naturally becomes a social learning environment which nurtures students' developing skills and is a very valuable foundation for practice beyond graduation, providing a level of support that will be absent later in their careers. The students are very supportive of each other, and form close social bonds, which provide moral and emotional support, technical support, and support with creative development. The intensity of this support is clear when it shows itself in a collective dance for joy in the workshop to celebrate the completion of a complex soldering job, and its more measured manifestations include making suggestions on how to resolve a peer's design problem and commiserating with peers about low marks.

A telling demonstration of the socially embedded nature of their learning is students' willing contribution of their individual strengths to the collective 'pot', with students who have acquired specific skills earlier in their careers, say in engineering, supporting the learning of their colleagues. For example a mature student with several years of experience in an industrial metalworking environment supports his peers in resolving their making problems. In this spontaneous social learning 'economy' this gift is reciprocated

as his peers support him in his struggles with his creative development, taking pains to assist him in idea development, and to interpret critical design advice from staff. This generosity is tempered by a sense of competition between students. In the classic model a designer/ maker is someone who works alone and this may be the basis for the resistance that is sometimes observed in students to share ideas and discoveries and for the disputes over the ownership of ideas that sometimes result from students learning together.

Mainly the positives outweigh the negatives and staff take steps to encourage a good group dynamic by enhancing the interactions that take place in the teaching spaces with organised field trips where learners are all exposed to the same challenge of a new environment. Standard teaching methods such as supported group work, peer assessment and group tutorials and crits are also designed to encourage students to be supportive, and constructive to their peers, and to share resources and ideas. For example, one teaching method builds a mutual support system by pairing learners and asking them to write down one another's goals. They each then summarise the work the other has completed so far, and are encouraged to write both positive comments, and constructive criticism. Each learner is then asked to check their fellow's progress, providing them with support, encouragement and constructive criticism, reporting back at the following week's tutorial.

Part of helping develop students' independence in developing their skills is providing resources and advice and, latterly, these have included shared on-line resources to enhance face to face contact. But learners don't seem motivated to contribute to online discussions, perhaps perceiving this type of resource to be unnecessary as it replicates in an attenuated form the rich face to face interaction that their social space affords, and precludes the physical dimension of that interaction. It is the physical nature of craft skills that makes the learning of them distinctive and in which direct physical contact between learner and teacher is sometimes necessary and a conventional part of the process.

For instance, when I (Author 2) do silver soldering, or teach it, I draw on my own undergraduate experience – my strong memory of learning how to solder a complex form. The expert (my tutor) held my arm and guided the heat over the metal and we took it in turns to feed the solder into the seam. During this experience, my embodied understanding of the process 'clicked'; I understood what it felt like, looked like and sounded like to control the heat and the solder successfully through a physical and sensual experience. This suggests that working very closely with one 'expert', is a very effective way of learning a craft skill. Making is an activity with physical and intellectual dimensions that work together; operations and techniques need to be seen and directly experienced to be fully understood as the learner recognises the physical feeling of doing it right.

The students themselves demonstrate this embodied dimension to learning when they complain occasionally that tutors do not tell them all about a technique. To them it feels like a conspiracy – the tutors are keeping information from them. As inexperienced learners they do not recognise that listening to information would not suffice and that they can only really understand some of the physical aspects of craft metalwork by experiencing the process and learning to recognise what it feels like to them to achieve a successful result. Just as once achieved, practical craft knowledge means we 'know more than we can tell', to achieve it also means learning how to use our bodies in the world in ways that can't be told.

For all that this means that we continue to use traditional modes of learning to develop skills in students, but economic pressures on higher education mean that the way learning is achieved must evolve. Finding ways to use of computers to support teaching is an obvious possibility, but these new methods are as yet undeveloped. We continue to use the traditional teaching methods described above, but these are difficult to use effectively

with large groups, where it is difficult to develop close working relationships with individual students. For staff trained through apprentice-style teaching methods, learners taking advice from each other seems problematic. Even though a proportion of craft learning demonstrably comes about through embodied experience, on the traditional view of teaching advanced craft skills, there can be no substitute for learning from the expert. This attitude, combined with students' understandable tendency to take advantage of the real people who are present in their learning space rather than virtual versions of them, also militates against the adoption of formal learning support provided on line.

The examples outlined below explore ways that the physicality and intimacy of traditional ways of learning craft skill may be replicated, complemented or replaced in a virtual environment. The previous experience of the learners in each of the examples varies and whereas BA students usually start as relative novices, the learners in the following examples start as relative experts. In the next example, the scope of the learning is restricted the processes of knife making and learners were given a face to face induction before being encouraged to get support from an online resource. The final example tells of the experiences of a relative expert accessing spontaneously given support from peers. Their level of previous experience may significantly influence the way that learners access support and pursue learning as along with relative experience comes relative confidence and an enhanced ability to independently form the personal 'analogies' on which craft learning is based.

## *Example 2: Structured learning mediated by a wiki*

Wood's current study centres on the skills of traditional custom knife makers in Sheffield, which was once the centre of the UK's knife making industry. This industry has now declined to the point where only a few master craftsmen remain, though there are people interested in preserving and learning their skills. The aim of the research is to design an interactive media resource to support those wishing to learn the skills needed to make a traditional folding knife. This draws on Wood's previous research that evolved a set of principles for the design of multimedia learning materials (Wood & Rust 2003) which moved on to develop techniques for elicitation of expert knowledge from craft masters (Wood 2006). The current project develops a new way to elicit and represent craft skills by bringing together three elements; learners, masters and online learning resources. A contemporary knifemaker, Grace Horne, operates as an expert learner working with a group of 'learner-participants' and acts as intermediary between Wood as the designer of the learning resources and some master craftsmen.

The learner-participants represent a generation of younger creative metalworkers interested in adapting traditional skills to new craft practices. This points up the impact of changes in the economic and cultural landscape on craft practice, and the innovative uses to which old skills can be put by a new generation of creative cultural entrepreneurs confirms the potential economic value of the research. The learning material has been initially developed through video observation of Horne working with the master craftsmen. Subsequently Wood and Horne have worked together to refine the masters' semi-industrialised process into one suitable for custom knife making using simple hand tools. The result was written up as a low-fidelity prototype[1] learning resource which was refined as a result of observing Horne guiding a group of novice learners through the process.

These prototype learning materials were then developed into an interactive version available on the internet via a wiki[2]. The aim was that, after making one knife under the

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[1] a paper-based resource consisting of notes and sketches used to support Horne's teaching

[2] on-line software that allows users to collaboratively create, edit, link, and organise the content of a website

guidance of Horne, and therefore no longer being complete novices, the learners would continue to make knives using the wiki for guidance. The initial pages created by Wood were locked so only she could edit this material, but learners were encouraged to use the discussion tabs available on each page for interaction and feedback. Two other pages were left open for the learners to alter as they wished; one intended for them to be able to ask Horne for help, the other as a space for them to post images of their work.

The outcome of the process was mixed however, as the initial group of three learners did not use the resource at all, which may have been a consequence of the recruitment strategy and also because they were provided with printed versions of the material. Two of the learners were recruited from the Metalwork & Jewellery BA programme (see above) and were not active computer users. They also saw Horne regularly in the University workshops so could ask directly for assistance – they had no more need to use an online resource for this work than in their everyday studies and were characteristically unwilling to do so. The third, recruited from the British Blades knifemakers forum, did not have some key equipment in his own workshop to enable him to continue making folding knives.

Consequently a second group of five learners was recruited entirely from the British Blades forum, and able to fulfil some specific requirements. These requirements were included that they have access to appropriate workshop and computer equipment. These learners spent a week looking at and handling as many folding knives as possible to consider what they liked and what they did not, after which they were to email Wood some pictures of inspirational knives along with initial sketches of what they would like to make. They were also given access to the wiki during this time so they could see the task they were going to follow. All five responded quickly with photos and sketches and these were used to set up a project page for each to record their progress with the instruction that they could post further images themselves or email them to Wood to post. Three of the five have since updated their own pages.

As the project progresses, to date three of the learners have been visited in their own workshops and all showed clear evidence of having accessed and made use of the on-line resource prior to our visit, and subsequent contact has shown they are continuing to make progress on their knives in their own time. However, so far, any questions they have raised or suggestions they have made have not taken place on the wiki. The learners have either emailed directly to Wood or Horne, or they have raised their issue as a general question on the open British Blades forum. For example, one learner asked for advice on the forum about how to solder, then emailed Horne to verify it would work with his knife before undertaking the task. He proudly posted images of the result both on the forum and the wiki when he was successful.

Whist this is not a major problem, Wood has posted summaries of the questions and answers on the wiki so they are accessible to other and subsequent learners, the researchers are keen to stimulate greater direct use of the wiki and are now looking for other ways to make this happen such as making the discussion part of the wiki more accessible and instigating some on-line ‘chat’ sessions to generate more peer support

This example confirms that relatively inexperienced learners may prefer to seek face to face support rather than to rely on accessing support online – even when this support is directly related to a real-world experience. The next example describes the a learner (Author 1) with craft skill using online means to acquire skills in a new are.

## *Example 3; The Geyer Guild.*

The third example of craft learning in the context of a distributed network draws from my (Author 1’s) experience of learning the craft of brass instrument making. A French horn player and ex-furniture maker, from 2000 I became motivated to learn how to build horns through repairing and modifying instruments. Briefly, my route to completing a prototype

instrument (in 2007) comprised a good deal of personal experimentation, as well as attending two courses, one in instrument repair run by Michael Rath, a trombone maker in Huddersfield UK, and one to reproduce a C17 natural trumpet run by Richard Seraphinoff, horn player and manufacturer of hand-horns.

These formal courses, though short, were highly productive in terms of learning as they allowed me to build on my modest metalworking skill and to acquire confidence as a metalworker. As important in the context of this paper they meant I put in place the first elements of my personal instrument making network, in the form of Anthony Halstead who is an important figure of long standing in the UK French horn world and Richard Seraphinoff. Both are horn players of world class standing and bring this expertise, skill and insight into instrument design and making.

Since the mid 1990s I had participated in public online discussion forums related to horn playing. Around 2002 I became aware of a members-only forum on Yahoogroups called the Geyer Guild, set up to '…exchange information and ideas about the building of (French) Horns. Links, files, photos and discussions help to keep alive the art and craft of fine instrument making.' It was some time before I was able to join this group – I had to make contacts with and prove myself to existing members. This happened over three years later when I had developed contacts with two existing members, one of whom, Stuart DeHaro, I knew through the public horn lists. Stuart did not refer to the Geyer Guild in his messages to me, but supported and followed my progress in skill acquisition. In 2005, he introduced me (via email) to Mike Bulow a US supplier of specially drawn brass tube and on hearing that I was working on French horn projects it was Mike who proposed me as a member of the Geyer Guild. This sequence of events demonstrates something of the nature of this group as a social entity; it is closed to outsiders and while it is not secret, the members are selective about who they admit.

In this context the relevance of the Geyer Guild as a social entity is matched by the way that its 23 members interact over specific craft and design issues. Perhaps because many of the members are already experienced makers 'threads' about making issues can be dominated by the less experienced members (myself included). The members are all but two located in North America and all except one are male. They include members who, like me, have a keen amateur interest in horn making as well as members who make modify and repair instruments for a living. Interacting with the members on line suggests that they are diverse in terms of the range of specific experiences they bring to the craft. At least one member was employed in the once strong US brass instrument industry and others had personal contacts with Carl Geyer, the US 20$^{th}$ century custom horn maker after whom the group is named.

This diversity is relevant to the specific ways that the group supports learning, in that there are patterns in the responses that reflect members' particular experience. Because of its nature, instrument making involves hand craft, technical knowledge and insights that come from musical skill. The Geyer Guild members are all horn players and among the most distinctive feature of the group is the way that discussions of craft issues are refracted through musicianship. This is demonstrated for instance in many threads about the design of crucial components that affect the way an instrument plays. There is also a degree of deference shown, one member to another, in respect of their relative standing in the group – their distance from the 'periphery' in Lave and Wenger's terms. So LB starts a message about how to separate two components thus:

*"Since no one else replied I guess that I'll have to put my limited knowledge forward."*

before going on to give an account of a process that speaks of a lot of skill and knowledge of this problem:

"*I've found that most of these thingees seem to be welded on, or maybe placed over the*

*LP before the receiver is expanded, because most are impossible to remove, especially after a dent. The only thing that I've found that works is to drill a hole in some steel the same diameter as the LP where the cover ends, and to remove a parallel section to the edge so that you have a U shape. Then heat up the tube, and insert the tube into the U which is placed into a vice, and pull like hell. Hopefully the LP won't break, which I've had happen before. I've also used some ring-nose pliers, that have rounded jaws, and a set screw that limits the closing of the jaws."*

Finishing with a statement that clearly shows his level of experience with these 'thingees':

*"Sometimes the damned things won't come off, no matter what you do."*

The Geyer Guild then, is a spontaneous creation by its members and its character is defined by their level of skill and experience with the matters that bring them together. If the three examples discussed are positioned on an expert/ novice spectrum the Geyer Guild sits towards the expert pole, with the members freely offering their experience and insights. However it has some things in common with the BA degree course 'space' for craft learning, in that it is a social space where some acquaintances of very long standing communicate. More than this, like the BA students, the members of the Geyer Guild are in principle in competition, which may limit the degree to which information is shared among them. For instance, the specification for the tapered parts of an instrument is crucial to its playing qualities and each maker's knowledge of what makes a playable specification – a good design - is hard won through time consuming experimentation or copying of existing instruments. This knowledge is unlikely to be shared – members may know more than they are prepared to tell of this.

Also, unlike both the previous examples the members of the Geyer Guild are separated geographically which fundamentally affects the nature of the information exchange that can take place. The basic embodied skills involved in instrument making cannot be acquired through online discussion. However, experience suggests that given some generic skill it can be very productive for a learner to make their own mistakes in their own space looking for solutions that can be specified in detail, post hoc, through discussion. This accords with Wood's research findings (Wood 2006, p138) where it is individuals who are to some extent 'mavericks' who are most effective at extending their embodied understanding of a process as they are most open to the necessary 'dwelling within' a problem and reflecting on their progress. Such a maverick, if also an expert learner, may be more willing as Dewey observed to prolong a state of doubt to provide a 'stimulus to thorough enquiry' (1933: 16). They do not wait for someone to tell them what cannot be told.

## *Discussion/ Conclusions*

This paper has done nothing more than identify some of the factors that affect whether and how craft learning can benefit from online resources. These include the level of previous experience of the learners, the nature of the skills they are aspiring to learn – whether highly embodied or more cognitive – and the nature of the social interactions that take place learner to learner, and learner to teacher. Further work is necessary to identify exactly which elements of craft learning work in which types of networked setting. Some settings may for instance particularly support the sort of 'destructive' analysis of problems that Polanyi identified or the analysis of 'surprises' encountered in practice that Schon and Argyris noted (Schon 1983, Argyris 1995).

The examples outlined above might suggest that in learning crafts, face to face contact is preferable to either wiki or email and that this is therefore the most effective mechanism for craft learning. For instance, Author 2's jewellery students will consult their (possibly in-expert) peers rather than use online resources. It would be important to qualify this

conclusion by noting that the degree to which it applies varies in line with a number of other factors. If the learner is a relative novice in all skills there may be no substitute for 'traditional' face to face learning. However, for an expert learner – i.e. a person who is highly skilled in other craft operations and can transfer or modify their existing knowledge into the new context – it may sufficient for face to face contact to be a relatively minor part of their learning which is otherwise supported by virtual means. Tom Fisher learnt instrument-making as an ex-furniture maker and could therefore continue to progress after a few short episodes of instruction.

Similarly, the appropriate balance between 'hands on' and 'hands off' may differ depending on the nature of the learning in question. It may be a rather different matter learning how to deal with a particular problem of folding knife assembly, or instrument repair, or jewellery construction than perfecting the skill of blade grinding, or silver soldering or tube drawing. The former present their own challenges, but perhaps because the skills necessary to meet them are more intellectual than embodied and can therefore be rendered in text they naturally suit the virtual medium as it is usually encountered.

This conclusion however reduces the contribution to craft learning of online resources to 'mere' words and pictures, ignoring the ways that the social networks that they comprise can contribute to learning. A recent YouTube video by an anonymous *Geyer Guild* member shows him deploying a range of skills and techniques that he has learned or perfected through online interaction with the group to produce a creditable horn. It concludes with a screen bearing the words: 'With special thanks to guys in the group. You know who you are'.

This points to a possible key difference between a textbook and an online group. It seems to be the degree to which they enable their members to participate in the same social space, albeit one that is a much attenuated version of the traditional teaching workshop, that makes online interactions effective in supporting craft learning. Such a social space can facilitate peer learning, and it can accommodate banter which may be the equivalent of the lighthearted peer support found in a teaching workshop; even if it is not possible to replicate dancing for joy.

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